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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,653	02/28/2006	Shuichi Ichikawa	126975	2424

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EXAMINER	
GUGLIOTTA, NICOLE T	
ART UNIT	**PAPER NUMBER**
1794	

NOTIFICATION DATE	DELIVERY MODE
11/27/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/567,653	ICHIKAWA ET AL.	
	Examiner	Art Unit	
	NICOLE T. GUGLIOTTA	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 July 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6 - 14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6 - 14* is/are rejected.

7)☒ Claim(s) *11 & 13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/15/2009, 10/26/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Examiner's Note

Examiner acknowledges the amendments to claims 6 and 9, as well as the addition of claims 11 - 14. Examiner acknowledges no new matter has been added.

Claim Objections

1. Claims 11 and 13 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 11 fails to further limit claim 10, which it is dependent on. Claim 13 fails to further limit claim 8, which it is dependent on.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 6 – 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al. (US 2003/0021949 A1), in view of Irick, Jr. et al. (U.S. Patent No. 4,957,779), as evidenced by Haby (The Weather Prediction), The Weather Channel (www.weather.com/glossary/a.html), Gutenberg's notes on Steam & Natural gas**

Combustion (http://www.gutenberg.org/files/22657/22657-h/chapters/combustion.html & http://www.gutenberg.org/files/22657/22657-h/chapters/gases.html), and further in view of Farrauto et al. (U.S. Patent No. 5,462,907) .

In regard to claims 6 & 9, Tomita et al. disclose a honeycomb filter formed by extrusion (Example 1, ¶ [0045]) and

> a process for producing a **silicon carbide-based porous body**, characterized by adding metallic silicon and an organic binder to **raw material silicon carbide** particles, mixing them, molding the mixture to a predetermined shape, calcinating the molded material in an oxygen-containing atmosphere to remove the organic binder in the molded material, and firing the calcinated body to obtain a silicon carbide-based porous body wherein an **oxygen-containing phase is formed at the surfaces of the silicon carbide** particles and/or the metallic silicon or in the vicinity of the surfaces thereof (¶ [0018]).

The oxygen-containing phase disclosed by Tomita et al. above corresponds to Applicants' "oxide film on the surface of the porous honeycomb structure."

Tomita et al. are silent in regard to the presence and amount of steam for the heat-treatment step (Applicant's claims 6 & 9). However, Irick, Jr. et al. disclose a method for producing a protective oxidizing layer on a ceramic body by the combustion reaction of natural gas in the furnace with air (an "oxygen-containing gas") (Col. 5, Lines 1- 5) and other additives (Col. 6, Lines 64 – 68; Col. 13, Lines 48 – 53). The combustion products of natural gas and air include water vapor (steam), as discussed below. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the limitation of the heat-treatment of Tomita et al. with the fuel source of natural gas and air (Applicant's claims 7, 12 & 14), which contributes to

producing a protective oxidized layer on a ceramic substrate, as suggested by Irick, Jr., et al.

In regard to Applicant's limitation for the presence of oxygen and steam, Examiner notes that air contains 20.9% oxygen (www.weather.com, see definition for "air") and water vapor in trace amounts to about 4%, as evidenced by Meteorologist Jeff Haby's discussion of Atmospheric Water Vapor (www.theweatherprediction.com). Table 50 in the reference of Gutenberg teaches natural gas is comprised mostly of methane (depending upon the geographic source of the natural gas), and upon combustion methane, in the presence of oxygen, produces volumetrically 2 mols of water (steam) for every 1 mol of carbon dioxide (Gutenberg, Table 31, Col. 13). This equates to about 66.67% by volume water vapor (WV) and about 33.33% by volume carbon dioxide. Hence, since air comprises trace amounts of water vapor and the combustion product of natural gas is at most 66% water vapor, it would be reasonable to believe the combustion of a mixture of natural gas and air in the furnace disclosed by Irick, Jr. et al. is $0 < \%$ vol WV ≤ 66.67. The exact amount within this range depends upon the ratio of natural gas and air present in the furnace. Therefore, it would be reasonable to believe when natural gas and air are used as the fuel source in a furnace for heat treating a ceramic honeycomb, as suggested by the combination of Tomita et al. and Irick, Jr. et al. above, it would be an oxygen-containing atmosphere and the amount of steam would be in the range of greater than 0% by volume to about 66.67% by volume.

In regard to the sequence of steps for claim 6, Tomita et al. disclose calcinating for "debindering", firing (sintering), and then heat-treatment (¶ [0048] - [0049], Examples 3 - 9).

In regard to the sequence of steps for claim 9, Applicants have failed to demonstrate firing before the heat-treatment and catalyst loading (as opposed to afterward, as disclosed by Tomita et al.) produce new or unexpected results, and therefore Applicants' claim limitation is *prima facie* obvious in the absence of new or unexpected results. *Ex Parte Rubin*, 128 USPQ 440. MPEP 2144.04 (Changing Sequence of Steps).

Tomita et al. do not teach the limitation of a catalyst containing alumina and ceria (Applicant's claims 6 & 9). However, Farrauto et al. disclose a catalytic coating comprising alumina and ceria for carriers such as silica-containing and other refractory metal honeycombs (Col. 7, Lines 1 – 24).

> The oxidation catalysts of the present invention [alumina and ceria] avoid or reduce the unwanted side effect of promoting the oxidation of SO_2 to SO_3 which, as noted above, contributes to the particulates problem because the condensation of sulfuric acid and other sulfate condensibles which accumulate on, and add to, the mass of the particulates in the exhaust (Col. 5, Lines 44 -51)…that a ceria-alumina catalytic material comprising essentially only ceria and alumina of sufficiently high surface area (10 m2/g or higher), dispersed on a suitable carrier, provides a durable and effective diesel oxidation catalyst (Col. 6, Lines 34 - 39).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the honeycomb with the silica coating disclosed by Tomita et al. with the catalyst coating disclosed by Farrauto et al. because an alumina/ceria catalyst coating reduces unwanted oxidation of SO_2 to SO_3, as well as produce durable and effective diesel oxidation catalysts.

In regard to claims 8, 10, 11 & 13, Tomita et al. disclose a heat treatment in oxidizing atmosphere at 500°C – 1600°C (¶ [0022]).

Response to Arguments

IIA. Tomita, Haby and Farrauto

Applicant argues, "Specifically, claims 6 and 9 are amended to recite 'the heat treatment is conducted in an atmosphere containing oxygen and 5 – 30% steam by volume.' The applied references fail to teach or suggest or establish any reason or rationale to provide such a combination of features as recited in claims 6 and 9" (Remarks, Pgs 4 – 5).

IIB. Tomita, Haby, Farrauto and Irick

Applicant argues, "Claim 7 depends from claim 6 and, thus, requires all the limitations of claim 6. Accordingly, the deficiencies of Tomita, Haby and Farrauto with respect to claim 6 are equally applicable to claim 7. Irick fails to suggest or establish any reason or rationale to provide 'the heat treatment is conducted in an atmosphere containing oxygen and 5 – 30% steam by volume,' and thus does not cure the deficiencies of Tomita, Haby and Farruato" (Remarks, Pg 5).

EXAMINER'S RESPONSE: Applicant's arguments with respect to claims 6 and 9 (parts IIA and IIB discussed above) have been considered but are moot in view of the new ground(s) of rejection.

IIC. Tomita, Saha and Farrauto

Applicant argues, "…Saha is directed to a mullite structure, which is an oxide ceramic. The Office Action provides no reason or rationale as to why one of ordinary skill in the art would expect the process of Saha to improve the strength of a non-oxide ceramic, such as silicon carbide, as required by claims 6 and 9. Furthermore, Saha even teaches away from silicon carbide. See Saha, page 1, line 28-page 2, line 2. Thus, for at least the reasons, and as acknowledged during the interview, there would have been no reason or rationale to combine the applied references to achieve the method of claims 6 and 9. Clearly, the only motivation to combine the applied referees (references) improperly comes from applicants' disclosure and claims" (Remarks, Pg 6).

EXAMINER'S RESPONSE: Applicant's arguments with respect to the references of Saha have been fully considered and are persuasive. The rejection of all claims previously rejected under the reference of Saha has been withdrawn.

III. New claims

Applicant notes, "Additionally, new claims 11 – 14 recite features clarifying that the heating temperature (during oxidation) of the present method is less than the melting point of both SiC (2700°C) and Si (1414°C). By contrast, the substrate for oxidation in Irick is a parent metal body and the heating temperature during oxidation is above melting point of the parent material (Irick, Col. 6, Lines 6 - 11)" (Remarks, Pg 7).

EXAMINER'S RESPONSE: First, regardless of the prior art used to reject the claims, claims 11 and 13 fail to further limit the claims which they are dependent on. Therefore, these claims are objected to, as discussed above.

Second, the examiner respectfully notes a honeycomb structure comprising elemental silicon (Si) is not a limitation of Applicant's claims. Thus the melting point of elemental silicon is a moot point.

Third, the examiner does not believe the reference of Irick, Jr et al. teaches against Applicant's claims or the reference of Tomita et al. The reference of Irick, Jr. et al. must be considered in its entirety. The temperature of the furnace in the disclosure of Irick, Jr et al. was set above the melting point of the ceramic in order to obtain a molten ceramic body and maintain the molten state while oxidizing (Irick, Jr. et al., Col. 6, Lines 6 - 11). It is important to note that although the oxidation step in the disclosure of Irick, Jr. et al. was performed around the same temperature as the melting step, this high temperature was necessary to "draw molten metal through the oxidation reaction…such that fresh oxidation reaction product continues to form at the interface" (Col. 6, Lines 14 - 19). Thus, it can be understood, when considering the reference of Irick Jr. et al. in its entirety, that a heat treatment temperature for oxidizing the initial surface of a ceramic (corresponds to the first "oxidation reaction" underlined above), and not for a continued oxidation reaction with the underlying ceramic (corresponds to the "fresh oxidation reaction product" underlined above), does not necessitate a temperature above the melting temperature of the ceramic substrate. In other words, it is only necessary to oxidize a ceramic surface above the melting point of that surface if one desires to oxidize the ceramic material to a greater depth than just those atoms on the surface of the ceramic in contact with the atmosphere. Examiner notes neither the reference of Tomita et al. or Applicant's claims desire a "fresh oxidation reaction

product" continued at the interface after the initial surface of the ceramic has been oxidized. In short, Irick, Jr. et al. do **not** explicitly state the oxidation of a ceramic surface can **only** occur above the melting point of the ceramic material. Therefore, Irick et al. do not teach against heat treating a surface below the melting point of a ceramic material in order to form an oxidized protective layer on the surface of the ceramic.

Fourth, it would have been obvious to one of ordinary skill in the art at the time of the invention that the heat-treatment temperature is dependent upon the type of ceramic material used for manufacturing the honeycomb structure. Tomita et al. disclose a process for manufacturing a silicon carbide based honeycomb, comprising a heat treatment step in an oxidizing atmosphere at 500°C – 1600°C (¶ [0022]). Thus, the prior art (Tomita et al.) teaches a heat treatment at the same temperature for the same material as claimed by Applicant. The reference of Irick et al. was combined with the teachings of Tomita et al. because Tomita et al. was silent in regard to the fuel source of the furnace used for heat-treating the ceramic honeycombs. Irick et al. teach natural gas as a known fuel source in furnaces used for heat treating (firing, calcinating, etc.) ceramic honeycombs, despite the type of ceramic material used for manufacturing the honeycomb structures. Tomita et al. teach a silicon carbide ceramic honeycomb should be heat-treated in the temperature range of 500°C – 1600°C to obtain an oxidized surface (¶ [0022]). Thus, there would be no reason to modify this teaching. As discussed above, Irick et al. do not teach away from the teachings of Tomita et al.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE T. GUGLIOTTA whose telephone number is (571)270-1552. The examiner can normally be reached on M - F 8:30 a.m. - 6 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Sample can be reached on 571-272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/
Supervisory Patent Examiner, Art Unit 1794

/NICOLE T GUGLIOTTA/
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